

Technical Article

UPDATE: Thermoformable Nylons
For IAPD Magazine
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In February of 2003 a leading extruder of engineered materials announced the first commercial availability of thermoformable nylons. This introduction created opportunities for thermoformers in growing global markets where material availability previously limited their participation. In this article we'd like to share some of those early applications and provide some insight into what is to come from these developments.

As part of the development process the viability of these materials for the forming process was confirmed by equipment manufacturers and thermoformers in both Europe and North America. Drying and processing parameters were established to aid thermoformers with their initial introduction to these new materials. Thermoformers in both geographic markets have been quick to refine processing techniques with their initial applications.

The first commercial application for thermoformable nylons was developed by an innovative west coast thermoformer. This group exceeded expectations with their first project by twin sheet forming the material. Twin sheet technology allows the thermoformer to manufacture hollow products in low volumes that would be prohibitively expensive if injection molded. Their product was a high performance air dam for BMW Series 5 autos. Thermoformable nylon was selected for its resistance to under hood fluids and its ability to withstand the high heat environment.

As expected, automotive applications continue to play a major role in thermoformed nylons. One major manufacturer of emergency vehicles selected a glass filled formulation for their in house manufacturing of radiator shrouds. Once again, the high heat capabilities and chemical resistance were factors but in this case the final design determinations came from the impact strength of the material. Competitive materials tended to fatigue and stress cracking developed around fastener points. The introduction of the glass filled nylon materials alleviated all of those problems. Radiator shrouds continue to be a growing application for heavy duty and extreme service vehicles and off road equipment.

In addition to the automotive interests in formable nylons other diverse applications are also growing. A three piece set of highly configured drain pans has been developed for an application with naval boiler systems. Nylon again provides the heat and chemical resistance required in these extreme environments.

Other market applications have included tote trays, instrument panels, sporting goods, and industrial equipment. The markets for products thermoformed with nylons are the same as those engaged by injection molding and fabrication. The economics of the three processes will be the determining factor in how products are produced.

As the markets have evolved and applications have been established, the offering of formulations has maintained a lead on the market. In two years time one leading extruder has built a family of six formable nylons. Varying levels of glass reinforcement are just part of the selection process. Types 6 and 6/6 nylons are available with and without impact modifiers and heat stabilizers. Heat Deflection Temperatures from 320-386F are available depending upon formulation.

The most popular grade to date has been a type 6 material with 15% glass reinforcement. This grade is both impact and heat ageing stabilized with an HDT of 338F. Other 15% grades have offered similar mechanicals with even extended HDT's to 356F.

The recent introduction of a higher performance grade is also getting strong initial acceptance in the market. The new grade has enhanced polymers that are 12% glass reinforced. This grade is delivering higher mechanical and thermal values than any of its predecessors. It is compounded for higher elongation and offers an HDT of 386F.

The materials are available from 0.010" to 0.250" thick in widths up to 50 inches. Products such as radiator shrouds tend to run in the thicker ranges while most cut sheet applications tend to be in the 0.125" area. The dominant extruder in this market is offering custom sizes with low minimum requirements as well as a complete size range of stock blanks in up to 4'x8'dimensions.

Future developments in these materials include variations with better burning behaviors. Most of these materials are listed as UL94-HB but work is underway to develop materials with ratings from V0 -V5.

Thermoformable nylon composites are also in the development stage. Early results have produced extremely lightweight high strength sheet for large thin walled sectioned products which require the benefits of an engineering nylon.

In summation, the future for thermoformable nylons looks to be very strong. The thermoforming community is very savvy about new applications and at least one global supplier has made a commitment for continued investment and development.

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